

EDL Pathfinder Missions

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NASA is developing a long-term strategy for achieving extended human missions to Mars in support of the policies outlined in the 2010 NASA Authorization Act and National Space Policy. The Authorization Act states that “A long term objective for human exploration of space should be the eventual international exploration of Mars.” Echoing this is the National Space Policy, which directs that NASA should, “By 2025, begin crewed missions beyond the moon, including sending humans to an asteroid. By the mid-2030s, send humans to orbit Mars and return them safely to Earth.” Further defining this goal, NASA’s 2014 Strategic Plan identifies that “Our long-term goal is to send humans to Mars. Over the next two decades, we will develop and demonstrate the technologies and capabilities needed to send humans to explore the red planet and safely return them to Earth.” Over the past several decades numerous assessments regarding human exploration of Mars have indicated that landing humans on the surface of Mars remains one of the key critical challenges.

In 2015 NASA initiated an Agency-wide assessment of the challenges associated with Entry, Descent, and Landing (EDL) of large payloads necessary for supporting human exploration of Mars. Due to the criticality and long-lead nature of advancing EDL techniques, it is necessary to determine an appropriate strategy to improve the capability to land large payloads. This paper provides an overview of NASA’s 2015 EDL assessment on understanding the key EDL risks with a focus on determining what “must” be tested at Mars. This process identified the various risks and potential risk mitigation strategies, that is, benefits of flight demonstration at Mars relative to terrestrial test, modeling, and analysis. The goal of the activity was to determine if a subscale demonstrator is necessary, or if NASA should take a direct path to a human-scale lander. This assessment also provided insight into how EDL advancements align with other Agency Mars lander activities such as the technology portfolio investments and post-2020 robotic Mars Exploration Program missions.